

What is claimed is:

- 1 1. A method for manufacturing a thyristor-based semiconductor device having a
- 2 substrate and a thyristor body region therein, the method comprising:
- 3 etching a trench in the substrate and adjacent to the thyristor body region, the
- 4 trench having a bottom;
- 5 implanting a portion of the thyristor body region and a first portion of the
- 6 substrate that is adjacent to the bottom of the trench with a first dopant at a first implant
- 7 energy, thereby forming a first doped well region and a first base region of the thyristor
- 8 body region;
- 9 annealing the first doped well region;
- 10 implanting a first thyristor emitter region in the first doped well region and
- 11 contiguously adjacent to the first base region, the first thyristor emitter region being of a
- 12 polarity that is opposite the polarity of the first doped well region, the first doped well
- 13 region being susceptible to carrier accumulation via carrier drainage from the first
- 14 thyristor emitter region;
- 15 forming a carrier coupler electrically coupled to the first doped well region, the
- 16 carrier coupler being configured and arranged to drain carriers accumulated in the first
- 17 doped well region; and
- 18 forming a control port in the trench and adapted to capacitively couple to the
- 19 thyristor body and to control current in the thyristor body.

1 2. The method of claim 1, further comprising:
2 using a second implant at a second implant energy that is higher than the first
3 implant energy, implanting a second portion of the substrate that is below the trench and
4 contiguously adjacent to the first doped well region with a second dopant, thereby
5 forming a second doped well region, the first and second doped well regions being of the
6 same polarity; and
7 wherein forming a carrier coupler electrically coupled to the first doped well
8 region includes forming conductive material extending to the second doped well region
9 and electrically coupled to the first doped well region via the second doped well region.

1 3. The method of claim 1, further comprising:
2 forming a carrier recombination center in a current path through the first emitter
3 region.